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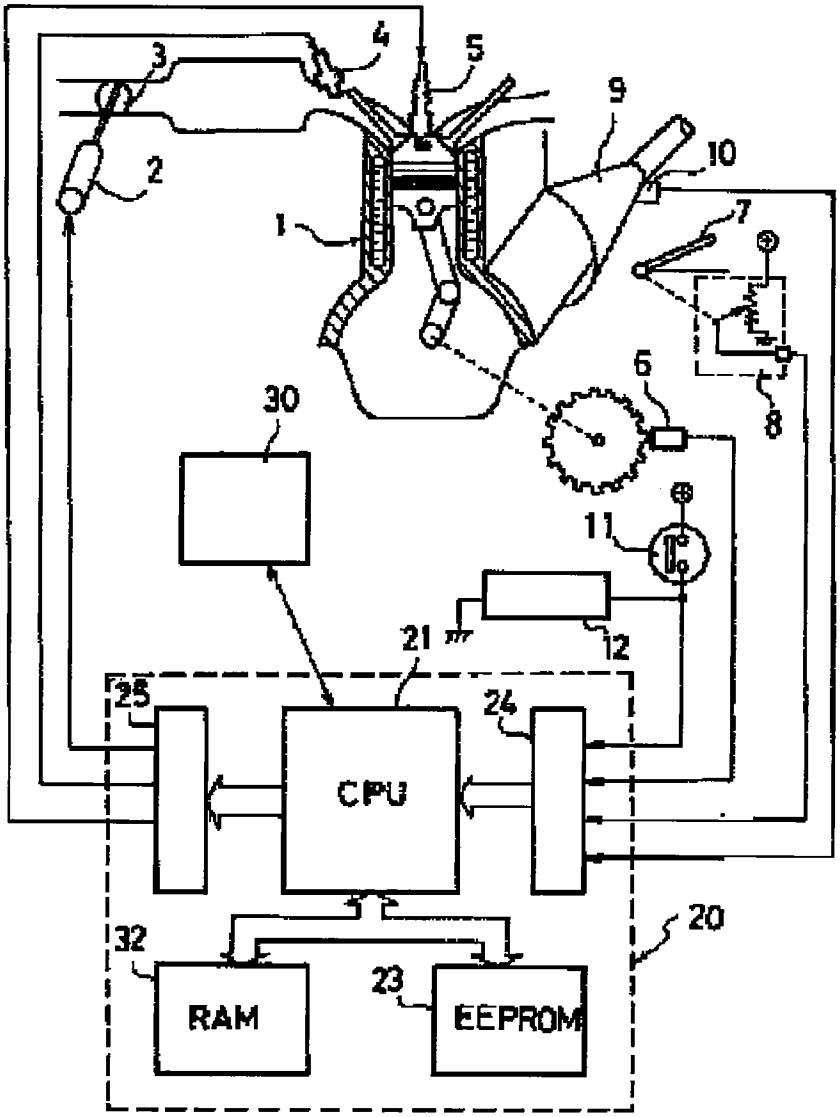
(54) DATA RECORDING DEVICE FOR AUTOMOBILE

(57) Abstract:

PURPOSE: To record data even in case of an accident by a driving error by detecting a car stoppage time before an engine stoppage by combination of at least two of a car velocity, an engine rotation number, and an ignition switch off, and recording and holding driving data before and after car stoppage for about three times before the engine stoppage.

CONSTITUTION: For a control unit 20, signals from a crank angle sensor 6, an accelerate-ion sensor 8 for detecting a stepped angle of an acceleration pedal, a car velocity sensor 10 to detect a car velocity based on an output shaft rotation of a transmission 9, and an ignition switch 11 are inputted, and a CPU 21 detects these constantly for using them for control, and it records the data in a RAM 32. A car stoppage is determined when the car velocity becomes 0km/h, and after recording the data till about 10sec. passes after the car stoppage, the data in the RAM 32 are transferred to an EPROM 23. An engine stoppage is determined by the ignition switch 11, and data for the engine stoppage are recorded and held in the EPROM 23.



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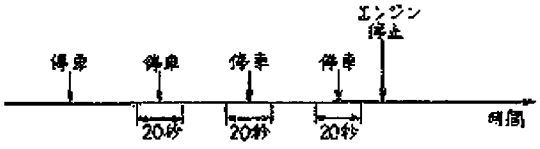
(54)【発明の名称】　自動車用データ記録装置

(57)【要約】
【目的】　運転ミスによる事故の場合にも高い確率でデータを記録できるようにする。
【構成】　車速、エンジン回転数又はイグニッションスイッチのオン・オフの少なくとも２つの組合わせにより、エンジン停止前の停車時を検出する。そして、エンジン停止前の３回程度の停車時について、停車前後の運転データを記録保持する。



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【特許請求の範囲】
【請求項１】自動車の車速，エンジン回転数又はイグニションスイッチのオン・オフを検出する手段を有すると共に，これらの少なくとも２つの組合わせにより決定されるタイミングで自動車の運転データを記録する手段を有することを特徴とする自動車用データ記録装置。
【請求項２】前記タイミングはエンジン停止前の停車時であることを特徴とする請求項１記載の自動車用データ記録装置。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は、自動車用データ記録装置に関し、詳しくは、自動車の異常発生時の運転データを記録する装置に関する。
【０００２】
【従来の技術】従来この種の自動車用データ記録装置として，電子システム診断テスターと呼ばれるものを車載してコントロールユニットに接続し，これを自動記録モードに設定しておくことにより、コントロールユニットの不具合判定の最新結果の異常発生時及びエンスト時に，異常発生前後の自動車の運転データが自動的に記録されるようにしたものがある（日産自動車株式会社発行「日産コンサルト　電子システム診断テスター　取扱説明書　エンジン編」第27頁参照）。これにより，故障時に記録されたデータから，故障原因を確率良く鑑定することができる。
【０００３】従来例について更に詳述する。エンジン制御用コントロールユニットは、ＣＰＵ，ＲＡＭ，ＥＥＰＲＯＭ及び入出力回路を含んで構成されるが、これに、ＣＰＵと通信によりデータ交換ができる電子システム診断テスターが接続される。このようなシステムにおいて，ＣＰＵは，常時，エンジン回転数やアクセル開度等を検出し、制御に用いる他に、ＲＡＭにデータを記録する。この場合，ＲＡＭには20秒間分のデータを記録する領域が確保されており、20秒周期でデータを上書きして記録する。
【０００４】そして、エンジン回転数が20rpm 以下になったときにエンストと判断し、エンスト後10秒経過するまでデータを記録後，ＲＡＭ内の所定領域のデータをＥＥＰＲＯＭの所定領域に移す。これにより、図７に示すように、エンスト検出前10秒間とエンスト検出後10秒間のデータがＥＥＰＲＯＭ内に記憶される。
【０００５】記録動作の詳細は、図８のフローチャートに示すプログラムの通りである。このプログラムは10msec毎に繰り返し実行され，毎回、エンジン回転数が20rpm 以下であるか否かによりエンスト判定を行い（Ｓ51）、エンストでない場合は、フラグＦＭＥＭＯを０にして（Ｓ52）後，アドレスカウンタＮをカウントアップする（Ｓ53）。尚、Ｎが2000になったときは０に戻し（Ｓ54，Ｓ55），これにより０～1999までのカウントアップを繰り返し行わせる。

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【０００６】そして、記録データD_1～D_{10}を入力し（Ｓ56），０～1999までを繰り返すＮに対応するＲＡＭ内のＮ×10番地～Ｎ×10＋９番地に書込んで記録する（Ｓ57）。D_1～D_{10}の値は，例えばエンジン回転数であったり、エンジン冷却水温であったりする。このようにして、エンジン回転中は，最新のデータをＲＡＭの所定領域に上書きしつつ順番に書込むことにより，常時、20秒間分のデータを記録する。
【０００７】エンストした場合は、エンスト後10秒経過したか否かを判定し（Ｓ58），10秒経過する前は，上記のＲＡＭへの記録を続け（Ｓ53～Ｓ57），10秒経過した時点で、フラグＦＭＥＭＯの判定（Ｓ59）後、ＦＭＥＭＯ＝１として（Ｓ60）から，20秒間分のデータをＲＡＭの０番地～ 19999番地から読出し、ＥＥＰＲＯＭの０番地～ 19999番地に書込む（Ｓ61）。また、このときの最新のデータ位置を示すアドレスカウンタＮの値を同じくＥＥＰＲＯＭの20000,20001番地に書込む（Ｓ62）。この後は、フラグＦＭＥＭＯの判定（Ｓ59）により，電源がオフとなる。
【０００８】このようにすることにより、データD_1～D_{10}について，エンスト前10秒間とエンスト後10秒間のものをＥＥＰＲＯＭに記憶保持することができる。そして，電子システム診断テスターの要求により、通信機能を用いて、記憶保持したエンスト前後のデータを送信することができる。以上が自動車用データ記録装置の従来例である。この例では、エンスト時の場合について説明したが、エンストを故障発生時としても同様に記録保持できることは明らかである。
【０００９】
【発明が解決しようとする課題】しかしながら，このような従来の自動車用データ記録装置にあっては，エンスト時や故障検出時に記録することはできるが，運転者の運転ミスにより，例えばブレーキペダルとアクセルペダルとを誤って踏み違いをして、車故が発生したような場合には，故障ではないので，データは記録されず，このために車故時に原因を究明できないという問題点があった。
【００１０】このような場合に問題になるのは，特に車故発生時であるので、車故を検出してデータを記憶保持する方式が容易に考えられる。そして，これを実施するには，例えば，既に商品化されているエアバッグの判断部分を用いる等の方法が考えられる。しかし、これでは，軽度の車故では検出できないし，これに要する費用も高い等の問題点があった。
【００１１】本発明は、このような従来の問題点に鑑み，運転ミスの場合にも高い確率でデータを記録でき、かつ安価な自動車用データ記録装置を提供することを目的とする。
【００１２】

【課題を解決するための手段】このため、本発明は、自動車用データ記録装置において、図1に示すように、自動車の車速、エンジン回転数又はイグニションスイッチのオン・オフを検出する手段を有すると共に、これらの少なくとも2つの組合わせにより決定されるタイミングで自動車の運転データを記録する手段を有する構成としたものである。

【0013】ここで、前記タイミングはエンジン停止前の停車時とするのが望ましい。

【0014】

【作用】本発明においては、一般的に事故発生時には車両を停止させること、そして現場保存後あるいは保存中、又は交通の支障がある場合は車両を片付けた後、一旦エンジンを止めるのが普通であることに着目した。このように、事故発生時は停車し、その付近でエンジンを止めるのが普通であるので、逆に言えば、事故があったとすれば、それは、エンジン停止前の1～3回程度の停車時であるといえる。

【0015】そこで、本発明では、車速、エンジン回転数又はイグニッションスイッチのオン・オフの少なくとも2つの組合わせにより、エンジン停止前の停車時を検出し、その前後のデータを記録保持するようにする。停車を検出する方法としては、車速を見るのが一般的であるが、エンジン回転数が所定値以下であることをもって停車と判定してもよい。

【0016】また、エンジン停止前を検出する方法としては、イグニッションスイッチのオン状態を検出することが一般的であるが、エンジン回転数により判定してもよい。よって、車速、エンジン回転数又はイグニッションスイッチのオン・オフの少なくとも2つの組合わせにより、データ記録のタイミングを決定する。

【0017】このようにすることにより、限られたメモリサイズの中で、高い確率で事故を検出できる。

【0018】

【実施例】以下に本発明の一実施例を説明する。図2にデータ記録装置のシステム図を示す。尚、以下では電子式スロットル制御を含むエンジン制御用コントロールユニットに対するデータ記録装置を例にとって説明する。

【0019】図2において、エンジン1への吸入空気量は、スロットルアクチュエータ2によりスロットル弁3が開閉駆動されて制御され、燃料供給量は燃料噴射弁4により制御される。そして、エンジン1内の吸入混合気は点火時期を制御されつつ点火栓5により点火されて燃焼する。ここで、スロットルアクチュエータ2、燃料噴射弁4及び点火栓5は、コントロールユニット20からの信号により制御される。

【0020】この制御のため、コントロールユニット20には、エンジン回転数を検出するクランク角センサ6、アクセルペダル7の踏み角（アクセル開度）を検出するアクセルセンサ8、トランスミッション9の出力軸回転より車速を検出する車速センサ10及びイグニッションスイッチ11からの信号が入力されている。尚、図中12は車両電気負荷を示している。

【0021】コントロールユニット20は、CPU21、RAM22、EEPROM23、入力回路24及び出力回路25を含んで構成されている。そして、コントロールユニット20には電子システム診断テスター30が接続され、この電子システム診断テスター30は、CPU21と通信によりデータ交換ができる。

【0022】このようなシステムにおいて、CPU21は、常時、エンジン回転数やアクセル開度等を検出し、制御に用いる他に、RAM22にデータを記録する。この場合、RAM22には20秒間分のデータを記録する領域が確保されており、20秒周期でデータを上書きして記録する。そして、車速が0 km/hになったときに停車と判断し、停車後10秒経過するまでデータを記録後、RAM22内のデータをEEPROM23に移す。

【0023】また、イグニッションスイッチ11によりエンジン停止を判断し、図3に示すように、エンジン停止（イグニッションスイッチ11オフ）前3回分の停車前後のデータをEEPROM23上に記憶保持する。尚、EEPROM23には、図4に示すように、20秒間分のデータ（停車前10秒間と停車後10秒間のデータ）を3×10=30個記録する領域が確保されており、図3に示したエンジン停止前3回分の停車前後のデータを、10個記録保持できる。

【0024】記録動作の詳細は、図5及び図6（図6は図5の続き）のフローチャートに示すプログラムの通りである。このプログラムは10msec毎に繰り返し実行される。ステップ1（図にはS1と記してある。以下同様）では、基本的に停車時にデータを記録保持するようにするため、車速センサ10からの信号に基づいて車速が0 km/hであるか否かを判定する。尚、エンジン回転数が所定値以下であることをもって停車時と判定してもよい。

【0025】車速が0 km/hでない場合は、ステップ2でフラグFMEMOを0にして後、ステップ3でRAM用アドレスカウンタNをカウントアップする。尚、Nが2000になったときは0に戻し（ステップ4，5）、これにより0～1999までのカウントアップを繰り返し行わせる。そして、ステップ6で記録データD_1～D_{10}を入力し、ステップ7で0～1999までを繰り返すNに対応するRAM内のN×10番地～N×10+9番地に書込んで記録する。

【0026】このようにして、車速が0 Km/hより大きい場合は、最新のデータをRAM22の所定領域（0～19999番地）に上書きしつつ順番に書込むことにより、常時、20秒間分のデータを記録する。車速が0 km/hとなった場合は、ステップ8で10秒経過したか否かを判定し、10秒経過する前は、ステップ3～7を実行して、上記のRAM22への記録を続ける。

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【００２７】10秒経過後は、ステップ９でのフラグＦＭＥＭＯの判定後、ステップ10でＦＭＥＭＯ＝１としてから、ステップ11へ進む。ステップ11では、ＥＥＰＲＯＭ23の600060，600061番地（図４のＭ格納用エリア）から後述するステップ20～22によりエンジン停止毎にカウントアップされて０～９までを繰り返すエンジン停止カウンタＭの値を読出す。このカウンタＭはＥＥＰＲＯＭ23の上位アドレス指定用として用いられる。

【００２８】次にステップ12で停車カウンタＬをカウントアップする。尚、Ｌが３になったときは０に戻し（ステップ13，14）、これにより０～２までのカウントアップを繰り返し行わせる。従って、このカウンタＬは停車毎にカウントアップされて０～２までを繰り返すもので、ＥＥＰＲＰＭ23の下位アドレス指定用として用いられる。

【００２９】そして、ステップ15では、20秒分の記録データをＲＡＭ22の０番地～ 19999番地から読出し、ＥＥＰＲＯＭ23の（Ｍ×３＋Ｌ）×20000 番地～（Ｍ×３＋Ｌ）×20000 ＋19999 番地へ書込む。また、ステップ16では、最新のデータ位置を示すカウンタＮの値を、ＥＥＰＲＯＭ23のＮ格納用エリア（図４参照；600000～600059番地）のうち、600000＋（Ｍ×３＋Ｌ）×２，600000＋（Ｍ×３＋Ｌ）×２＋１番地に書込む。

【００３０】これにより、Ｌが０～２までを繰り返すことで、ＥＥＰＲＯＭ23の（Ｍ×３）×20000 番地～（Ｍ×３＋２）×20000 ＋19999 番地の領域に、常に最新の３回分の停車前後のデータが上書きされつつ記録されるようになる。この後は、ＦＭＥＭＯ＝１であるので、ステップ９からステップ17（図６）へ進む。

【００３１】ステップ17では、イグニッションスイッチ11がオンか否かを判定し、オフとなった場合は、ステップ18でオフ後10秒経過したか否かを判定し、10秒経過した場合にステップ19へ進む。すなわち、エンジン停止をイグニションスイッチ11がオフとなって10秒後であることで検出し、ステップ19へ進む。尚、エンジン停止をエンジン回転数より判断してもよい。

【００３２】ステップ19では、ＥＥＰＲＯＭ23の600060，600061番地からエンジン停止カウンタＭの値を読出して、ステップ20でエンジン停止カウンタＭの値をカウントアップする。尚、Ｍが10になったときは０に戻し（ステップ21，22）、これにより０～９までのカウントアップを繰り返し行わせる。次のステップ23では、カウントアップされたエンジン停止カウンタＭの値をＥＥＰＲＯＭ23の600060，600061番地へ書込む。

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【００３３】これにより、次の始動後の走行時は、ＥＥＰＲＯＭ23の別の領域に、最新の３回分の停車前後のデータの記録保持が行われる。このように本実施例では、Ｍは０～９までの値をとるようになっており、データを例えば自動車整備工場で読出すときまでに、それまでの10回分の走行について、全てエンジン停止前３回分、計30回分の停車前後20秒間のデータを記憶保持できる。

【００３４】そして、この中に事故時のデータがあるのはかなり高い確率となる。

【００３５】

【発明の効果】以上説明したように、本発明によれば、事故を検出するために、車速、エンジン回転数、イグニションスイッチの２つ以上の組合わせを用いることにより、検出精度を上げ、且つエアバッグ等に用いられる事故判断機能等を用いることなく安価に検出できるようにすることにより、安価な自動車用データ記録装置を実現することができる。

【図面の簡単な説明】

【図１】　本発明の構成を示す機能ブロック図

【図２】　本発明の一実施例を示すデータ記録装置のシステム図

【図３】　同上実施例のデータ記録のタイミング図

【図４】　同上実施例のＥＥＰＲＯＭ記録領域を示す図

【図５】　同上実施例のフローチャート（その１）

【図６】　同上実施例のフローチャート（その２）

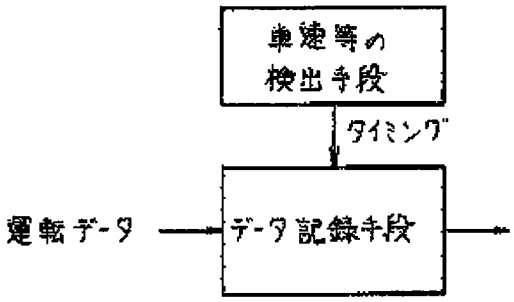
【図７】　従来例を示すデータ記録のタイミング図

【図８】　同上従来例のフローチャート

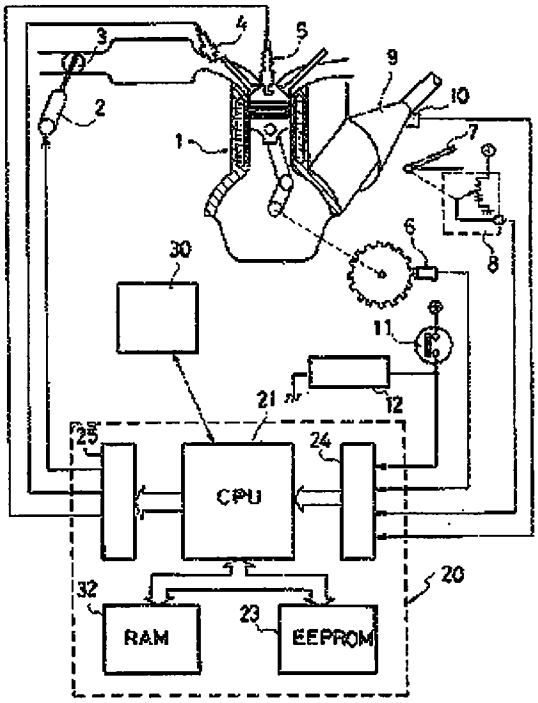
【符号の説明】

1　エンジン
6　クランク角センサ
10　車速センサ
11　イグニッションスイッチ
20　コントロールユニット
21　ＣＰＵ
22　ＲＡＭ
23　ＥＥＰＲＯＭ
30　電子システム診断テスター

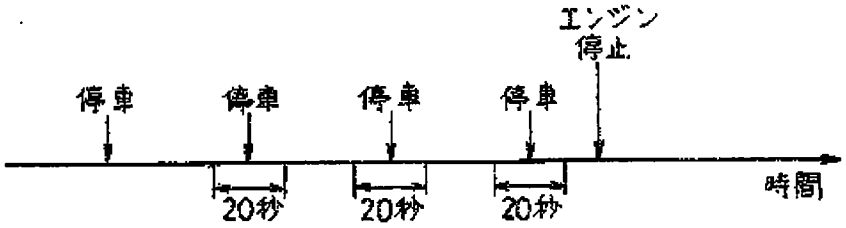
【図1】


車速等の
検出手段
タイミング
運転データ
データ記録手段

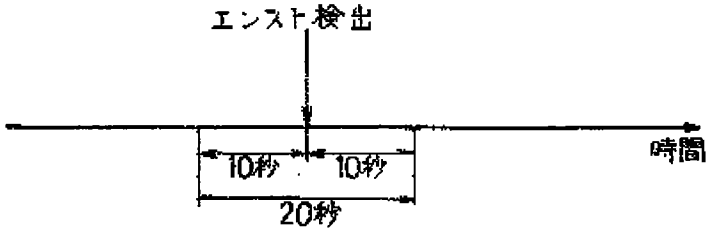
【図2】


1
2
3
4
5
6
7
8
9
10
11
12
21
24
25
30
CPU
20
32
RAM
23
EEPROM

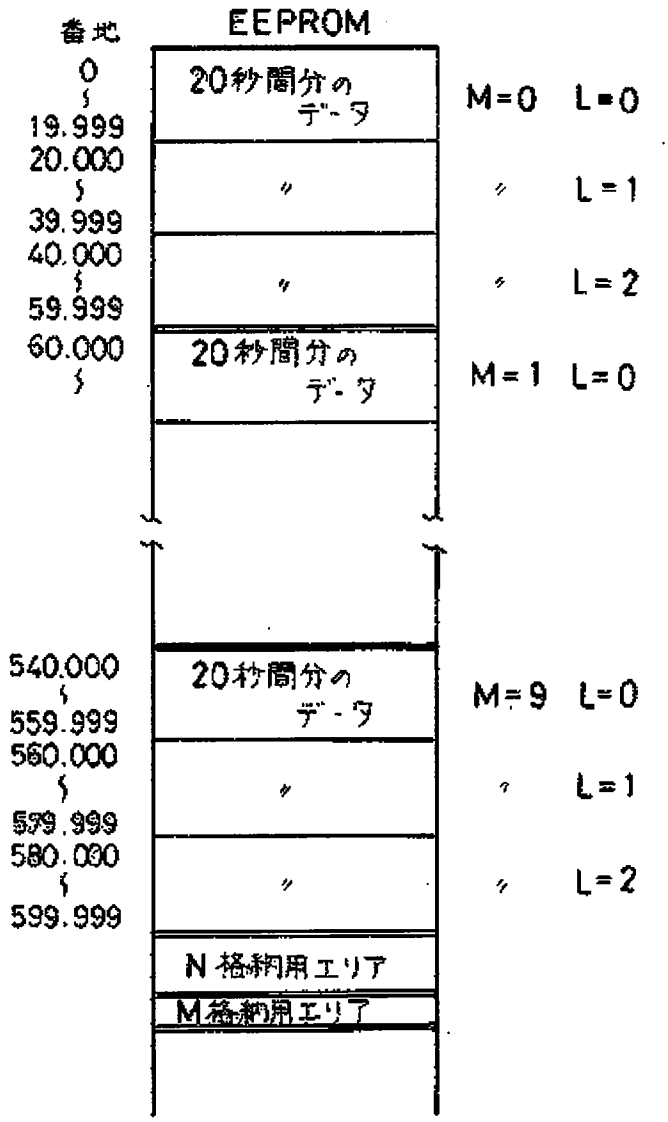
【図3】


エンジン
停止
停車
停車
停車
停車
時間
20秒
20秒
20秒

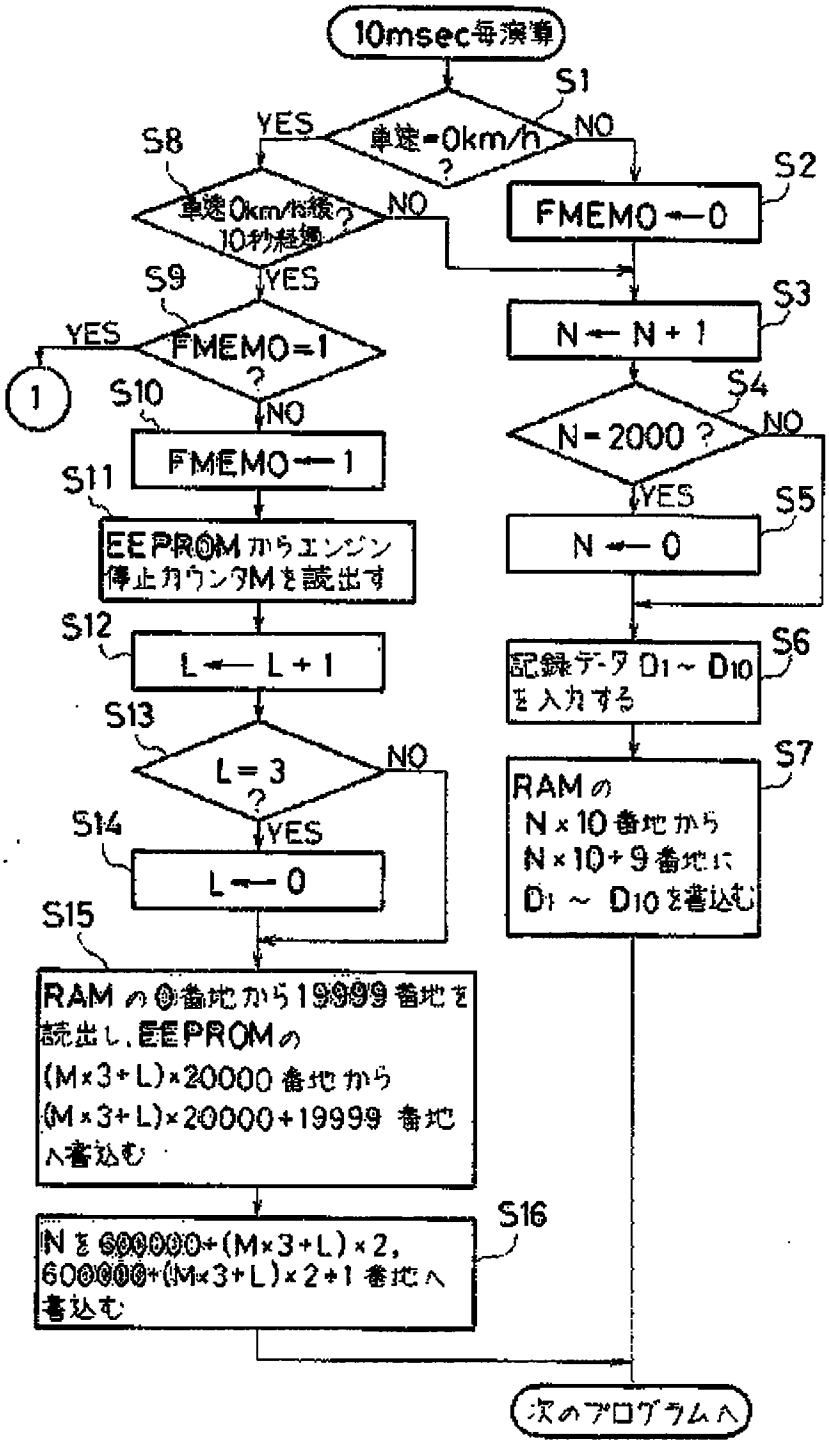
【図7】


エンスト検出
時間
10秒
10秒
20秒

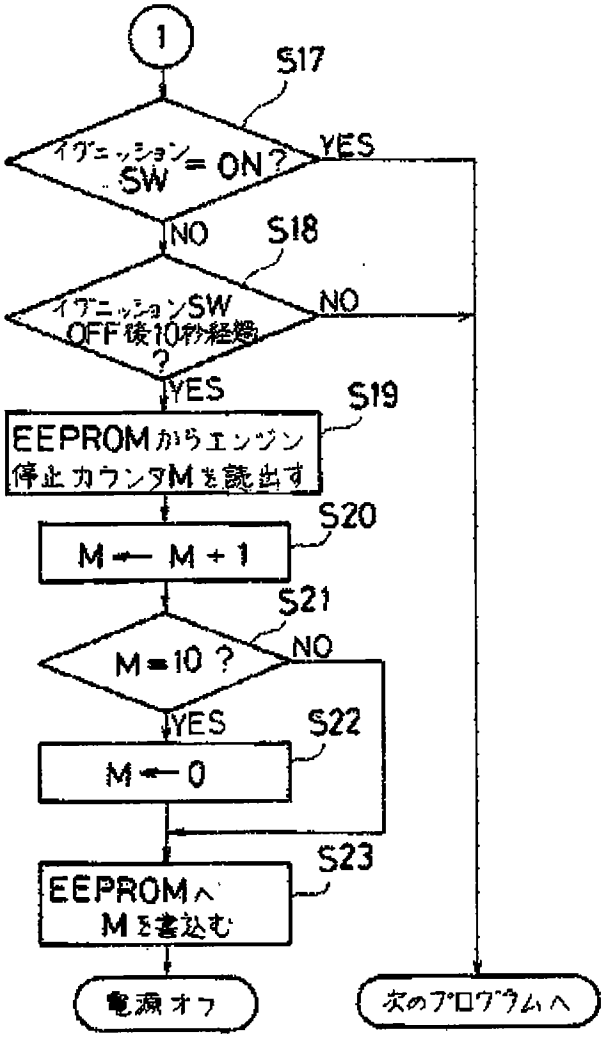
【図4】


番地
EEPROM
0
〜
19.999
20.000
〜
39.999
40.000
〜
59.999
60.000
〜
20秒間分の
データ
〃
〃
20秒間分の
データ
M=0　L=0
〃　L=1
〃　L=2
M=1　L=0
540.000
〜
559.999
560.000
〜
579.999
580.000
〜
599.999
20秒間分の
データ
〃
〃
M=9　L=0
〃　L=1
〃　L=2
N格納用エリア
M格納用エリア

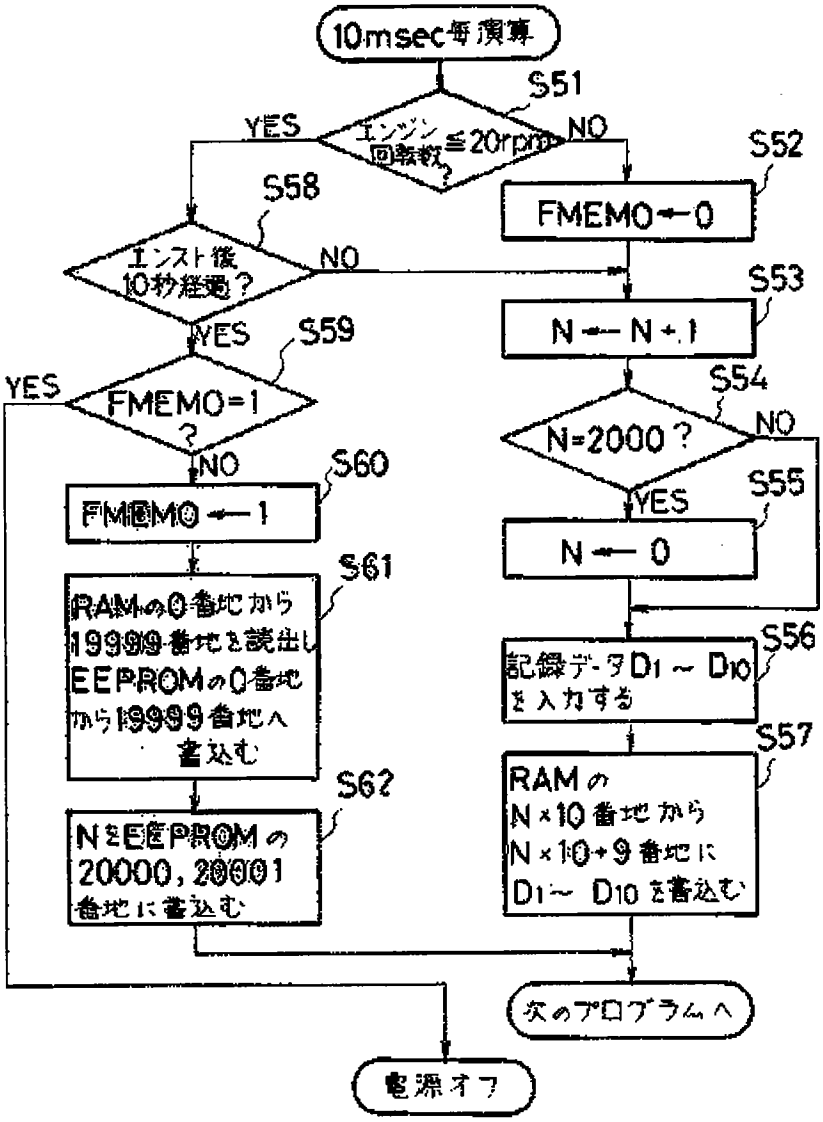
[図5]


10msec毎演算
S1
単速=0km/h ?
YES
NO
S8
単速0km/h後?
10秒経過
NO
YES
S2
FMEMO←0
S3
N←N+1
S4
N=2000 ?
NO
YES
S5
N←0
S6
記録データ D1～D10 を入力する
S7
RAM の N×10 番地から N×10+9 番地に D1～D10 を書込む
S9
FMEMO=1 ?
YES
NO
1
S10
FMEMO←1
S11
EEPROM からエンジン停止カウンタMを読出す
S12
L←L+1
S13
L=3 ?
NO
YES
S14
L←0
S15
RAM の0番地から19999番地を読出し、EEPROM の (M×3+L)×20000 番地から (M×3+L)×20000+19999 番地へ書込む
S16
N を 600000+(M×3+L)×2, 600000+(M×3+L)×2+1 番地へ書込む
次のプログラムへ

【図6】


1
S17
イグニッションSW = ON?
YES
NO
S18
イグニッションSW OFF後10秒経過?
NO
YES
S19
EEPROMからエンジン停止カウンタMを読出す
S20
M ← M + 1
S21
M = 10 ?
NO
YES
S22
M ← 0
S23
EEPROMへMを書込む
電源オフ
次のプログラムへ

【図8】


10msec毎演算
S51
エンジン回転数≦20rpm?
YES
NO
S52
FMEMO←0
S53
N←N+1
S54
N=2000?
NO
YES
S55
N←0
S56
記録データD1～D10を入力する
S57
RAMのN×10番地からN×10+9番地にD1～D10を書込む
S58
エンスト後10秒経過?
NO
YES
S59
FMEMO=1?
YES
NO
S60
FMEMO←1
S61
RAMの0番地から19999番地を読出しEEPROMの0番地から19999番地へ書込む
S62
NをEEPROMの20000,20001番地に書込む
次のプログラムへ
電源オフ

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CLAIMS

[Claim(s)]
[Claim 1] The data recorder for automobiles characterized by having a means to record the performance data of an automobile to the timing determined with these at least two combination while having a means to detect turning on and off of the vehicle speed of an automobile, an engine speed, or an ignition switch.
[Claim 2] Said timing is a data recorder for automobiles according to claim 1 characterized by being at the stop time before an engine shutdown.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the equipment which records the performance data at the time of the abnormal occurrence of an automobile in detail about the data recorder for automobiles.
[0002]
[Description of the Prior Art] As this kind of a data recorder for automobiles conventionally by mounting what is called an electronic system diagnostic circuit tester, connecting with a control unit, and setting this as automatic-recording mode At the time of the abnormal occurrence of the newest result of a nonconformity judging of a control unit, and an engine failure There are some on which the performance data of the automobile before and behind an abnormal occurrence was recorded automatically (refer to the Nissan Motor Co., Ltd. issuance "Nissan KONSARUTO electronic system diagnostic circuit tester operation manual engine editing" 27th page). Thereby, a cause of fault can be presumed with a sufficient probability from the data recorded at the time of failure.
[0003] The conventional example is explained further in full detail. Although the control unit for engine control is constituted including CPU, RAM, EEPROM, and an I/O circuit, CPU and the electronic system diagnostic circuit tester which can do the data exchange by communication link are connected to this. In such a system, always CPU detects an engine speed, an accelerator opening, etc., and uses them for control, and also it records data on RAM. In this case, the field which records the data for for 20 seconds is secured to RAM, and data are overwritten and recorded in a cycle of 20 seconds.
[0004] And an engine speed is 20rpm. The data of the predetermined field in [after recording data] RAM are moved to the predetermined field of EEPROM until it judges it as an engine failure and 10 seconds pass after an engine failure, when it becomes below. Thereby, as shown in drawing 7 , the data for [before engine failure detection] 10 seconds and for 10 seconds after engine failure detection are memorized in EEPROM.
[0005] The detail of record actuation is as the program shown in the flow chart of drawing 8 . For this program, it performs repeatedly every 10msec(s) and each time and an engine speed are 20rpm. Whether it is the following performs an engine failure judging (S51), when it is not an engine failure, Flag FMEMO is set to 0 and an address counter N is counted up the back (S52) (S53). In addition, when N is set to 2000, it returns to 0 (S54, S55), and thereby, count-up to 0-1999 is repeated, and is made to perform.
[0006] And the record data D1 - D10 are inputted (S56), and it writes in and records on Nx10th - the Nx10+9th street in RAM corresponding to N which repeats even 0-1999 (S57). The value of D1 - D10 is an engine speed, or is engine-coolant water temperature. Thus, the data for for 20 seconds are always recorded by writing in in order during an engine revolution, overwriting the newest data to the predetermined field of RAM.
[0007] When an engine failure is carried out, before it judges whether 10 seconds passed after the engine failure (S58) and 10 seconds pass it When record to the above-mentioned RAM is continued (S53-S57) and 10 seconds pass The data for for (S60) to 20 seconds are written in 0th - the 19999th street of read-

out and EEPROM from 0th - the 19999th street of RAM as FMEMO=1 after the judgment (S59) of Flag FMEMO (S61). Moreover, similarly the value of the address counter N which shows the newest data location at this time is written in the 20000 or 200001st street of EEPROM (S62). After this, a power source becomes off by the judgment (S59) of Flag FMEMO.
[0008] By doing in this way, storage maintenance of the thing for [before an engine failure] 10 seconds and for 10 seconds after an engine failure can be carried out about data D1 - D10 at EEPROM. And the data before and behind the engine failure which carried out storage maintenance can be transmitted by demand of an electronic system diagnostic circuit tester using communication facility. The above is the conventional example of the data recorder for automobiles. Although this example explained the case at the time of an engine failure, it is clear that the record maintenance of the engine failure can be similarly carried out as a time of failure generating.
[0009]
[Problem(s) to be Solved by the Invention] However, since it was not failure when a step on difference was carried out accidentally [accelerator pedal / a brake pedal and] and accident occurred by an operator's service abuse although it was recordable at the time of an engine failure and fault detection if it was in such a conventional data recorder for automobiles, data were not recorded, for this reason had the trouble that a cause could not be studied in case of accident.
[0010] In such a case, since it is especially becoming a problem at the occurrence time of accident, the method which detects accident and carries out storage maintenance of the data is considered easily. And in order to carry this out, approaches, such as using the decision part of the air bag already commercialized, can be considered. However, now, in slight accident, it could not detect and the costs which this takes also had troubles, such as being high.
[0011] This invention aims at being able to record data by the high probability also in the case of a service abuse, and offering the cheap data recorder for automobiles in view of such a conventional trouble.
[0012]
[Means for Solving the Problem] For this reason, in the data recorder for automobiles, this invention is considered as the configuration which has a means to record the performance data of an automobile to the timing determined with these at least two combination while it has a means to detect turning on and off of the vehicle speed of an automobile, an engine speed, or an ignition switch, as shown in drawing 1 .
[0013] Here, as for said timing, it is desirable to consider as the time of the stop before an engine shutdown.
[0014]
[Function] In this invention, when there is generally trouble of traffic after stopping a car and on-site preservation or during preservation at the time of the occurrence of accident, after putting away a car, it usually came out to once stop an engine and it paid its attention to a certain thing. Thus, it stops at the time of the occurrence of accident, and if there was accident when saying to reverse since the engine was usually stopped near the, it can be said that it is it at the about one - three stop time before an engine shutdown.
[0015] So, in this invention, the time of the stop before an engine shutdown is detected, and it is made to carry out record maintenance of the data before and behind that with the vehicle speed, an engine speed, or at least two combination of turning on and off of an ignition switch. Although it is common to see the vehicle speed as an approach of detecting a stop, you may judge with a stop with an engine speed being below a predetermined value.
[0016] Moreover, although it is common to detect the ON state of an ignition switch as an approach of detecting engine shutdown before, you may judge by the engine speed. Therefore, the vehicle speed, an engine speed, or at least two combination of turning on and off of an ignition switch determine the timing of data logging.
[0017] By doing in this way, accident is detectable by the high probability in the limited memory size.
[0018]

[Example] One example of this invention is explained below. The system chart of a data recorder is shown in drawing 2 . In addition, below taking the case of the data recorder to the control unit for engine control including electronic formula throttle control, it explains.
[0019] In drawing 2 , closing motion actuation of the throttle valve 3 is carried out by the throttle actuator 2, the inhalation air content to an engine 1 is controlled, and the amount of fuel supply is controlled by the fuel injection valve 4. and the inhalation in an engine 1 -- having ignition timing controlled, it is lit by the ignition plug 5 and gaseous mixture burns. Here, the throttle actuator 2, a fuel injection valve 4, and an ignition plug 5 are controlled by the signal from a control unit 20.
[0020] The signal from the crank angle sensor 6 which detects an engine speed, the accelerator sensor 8 which accelerator BEDARU 7 steps on and detects an angle (accelerator opening), the speed sensor 10 which detects the vehicle speed from the output-shaft revolution of transmission 9, and an ignition switch 11 is inputted into the control unit 20 for this control. In addition, 12 in drawing shows car electric load.
[0021] The control unit 20 is constituted including CPU21, RAM22, EEPROM23, the input circuit 24, and the output circuit 25. And the electronic system diagnostic circuit tester 30 is connected to a control unit 20, and this electronic system diagnostic circuit tester 30 can do the data exchange by communication link with CPU21.
[0022] In such a system, always CPU21 detects an engine speed, an accelerator opening, etc., and uses them for control, and also it records data on RAM22. In this case, the field which records the data for for 20 seconds is secured to RAM22, and data are overwritten and recorded in a cycle of 20 seconds. And the data in [after recording data] RAM22 are moved to EEPROM23 until it judges it as a stop and 10 seconds pass after a stop, when the vehicle speed becomes 0 km/h.
[0023] Moreover, an engine shutdown is judged with an ignition switch 11, and as shown in drawing 3 , storage maintenance of the data before and behind the stop of front [an engine shutdown (ignition switch 11 OFF)] 3 batch is carried out on EEPROM23. In addition, the field which records 10= 30 3x data for for 20 seconds (data for [before a stop] 10 seconds and for 10 seconds after a stop) as shown in drawing 4 is secured to EEPROM23, and the ten-piece record maintenance of the data before and behind the stop of front [engine shutdown] 3 batch shown in drawing 3 can be carried out.
[0024] The detail of record actuation is as the program shown in the flow chart of drawing 5 and drawing 6 (drawing 6 is a continuation of drawing 5). This program is performed repeatedly every 10msec(s). Step 1 (it is described as S1 in drawing.) In order to carry out record maintenance of the data fundamentally in it being the same as that of the following at the time of a stop, based on the signal from a speed sensor 10, it judges whether the vehicle speed is 0 km/h. In addition, you may judge with the time of a stop with an engine speed being below a predetermined value.
[0025] When the vehicle speed is not 0 km/h, Flag FMEMO is set to 0 at step 2, and the address counter N for RAM is counted up at step 3 the back. In addition, when N is set to 2000, it returns to 0 (steps 4 and 5), and thereby, count-up to 0-1999 is repeated, and is made to perform. And it writes in and records on Nx10th - the Nx10+9th street in RAM corresponding to N which inputs the record data D1 - D10 at step 6, and repeats even 0-1999 at step 7.
[0026] Thus, when the vehicle speed is larger than 0 km/h, the data for for 20 seconds are always recorded by writing in in order, overwriting the newest data to the predetermined field (the 0-19999th street) of RAM22. When the vehicle speed becomes 0 km/h, before it judges whether 10 seconds passed and 10 seconds pass it at step 8, steps 3-7 are performed and record to above-mentioned RAM22 is continued.
[0027] After the judgment of the flag FMEMO in step 9, after setting after 10-second progress to FMEMO=1 at step 10, it progresses to step 11. At step 11, the value of the engine shutdown counter M which counts up for every engine shutdown by steps 20-22 later mentioned from the 600060 or 600061st street (area for M storing of drawing 4) of EEPROM23, and repeats even 0-9 is read. This counter M is used as an object for upper address assignment of EEPROM23.
[0028] Next, the stop counter L is counted up at step 12. In addition, when L is set to 3, it returns to 0 (steps 13 and 14), and thereby, count-up to 0-2 is repeated, and is made to perform. Therefore, this

counter L is counted up for every stop, and is used as an object for lower address assignment of EEPRPM23 [2 / 0-].
[0029] And at step 15, they are read-out and 23 EEPROMs x(Mx3+L) 20000 from 0th - the 19999th street of RAM22 about the record data for 20 seconds. Address -(Mx3+L) x20000+19999 It writes in an address. Moreover, at step 16, the value of the counter N which shows the newest data location is written in the 2nd [600000+(Mx3+L) x] 600000+(Mx3+L) x2+1 street among the area for N storing of EEPROM23 (refer to drawing 4 ; the 600000-600059th street).
[0030] Thereby, they are 23 EEPROMs x(Mx3) 20000 by L repeating even 0-2. Address -(Mx3+2) x20000+19999 It comes to be recorded on it, the data before and behind the stop of the three newest batches always being overwritten by the field of an address. Since it is FMEMO=1 after this, it progresses to step 17 (drawing 6) from step 9.
[0031] At step 17, when an ignition switch 11 judges whether it is ON and becomes off, it judges whether 10 seconds passed after off at step 18, and when 10 seconds pass, it progresses to step 19. That is, 10 seconds after an ignition switch 11 becomes off, an engine shutdown is detected because it is, and it progresses to step 19. In addition, an engine shutdown may be judged from an engine speed.
[0032] In step 19, the value of the engine shutdown counter M is read from the 600060 or 600061st street of EEPROM23, and the value of the engine shutdown counter M is counted up at step 20. In addition, when M is set to 10, it returns to 0 (steps 21 and 22), and thereby, count-up to 0-9 is repeated, and is made to perform. At the following step 23, the value of the counted-up engine shutdown counter M is written in the 600060 or 600061st street of EEPROM23.
[0033] Thereby, record maintenance of the data before and behind the stop of the three newest batches is performed to another field of EEPROM23 at the time of the transit after the next start up. Thus, in this example, M can carry out [by] storage maintenance of the data for [before and after a stop] 20 seconds of front [engine shutdown] 3 batch and a total of 30 batches altogether about transit of the ten batches till then, when taking the value to 0-9 and reading data in a service station.
[0034] And it becomes a quite high probability that the data in case of accident are in this.
[0035]
[Effect of the Invention] The cheap data recorder for automobiles can be realized by enabling it to detect cheaply, without using the accident judgment function used for raising, an air bag, etc. in detection precision by using the vehicle speed, an engine speed, and two combination or more of an ignition switch in order to detect accident according to this invention, as explained above.

[Translation done.]

PRIOR ART

[Description of the Prior Art] As this kind of a data recorder for automobiles conventionally by mounting what is called an electronic system diagnostic circuit tester, connecting with a control unit, and setting this as automatic-recording mode At the time of the abnormal occurrence of the newest result of a nonconformity judging of a control unit, and an engine failure There are some on which the performance data of the automobile before and behind an abnormal occurrence was recorded automatically (refer to the Nissan Motor Co., Ltd. issuance "Nissan KONSARUTO electronic system diagnostic circuit tester operation manual engine editing" 27th page). Thereby, a cause of fault can be presumed with a sufficient probability from the data recorded at the time of failure.
[0003] The conventional example is explained further in full detail. Although the control unit for engine control is constituted including CPU, RAM, EEPROM, and an I/O circuit, CPU and the electronic system diagnostic circuit tester which can do the data exchange by communication link are connected to this. In such a system, always CPU detects an engine speed, an accelerator opening, etc., and uses them for control, and also it records data on RAM. In this case, the field which records the data for for 20 seconds is secured to RAM, and data are overwritten and recorded in a cycle of 20 seconds.
[0004] And an engine speed is 20rpm. The data of the predetermined field in [after recording data] RAM are moved to the predetermined field of EEPROM until it judges it as an engine failure and 10 seconds pass after an engine failure, when it becomes below. Thereby, as shown in drawing 7 , the data for [before engine failure detection] 10 seconds and for 10 seconds after engine failure detection are memorized in EEPROM.
[0005] The detail of record actuation is as the program shown in the flow chart of drawing 8 . For this program, it performs repeatedly every 10msec(s) and each time and an engine speed are 20rpm. Whether it is the following performs an engine failure judging (S51), when it is not an engine failure, Flag FMEMO is set to 0 and an address counter N is counted up the back (S52) (S53). In addition, when N is set to 2000, it returns to 0 (S54, S55), and thereby, count-up to 0-1999 is repeated, and is made to perform.
[0006] And the record data D1 - D10 are inputted (S56), and it writes in and records on Nx10th - the Nx10+9th street in RAM corresponding to N which repeats even 0-1999 (S57). The value of D1 - D10 is an engine speed, or is engine-coolant water temperature. Thus, the data for for 20 seconds are always recorded by writing in in order during an engine revolution, overwriting the newest data to the predetermined field of RAM.
[0007] When an engine failure is carried out, before it judges whether 10 seconds passed after the engine failure (S58) and 10 seconds pass it When record to the above-mentioned RAM is continued (S53-S57) and 10 seconds pass The data for for (S60) to 20 seconds are written in 0th - the 19999th street of read-out and EEPROM from 0th - the 19999th street of RAM as FMEMO=1 after the judgment (S59) of Flag FMEMO (S61). Moreover, similarly the value of the address counter N which shows the newest data location at this time is written in the 20000 or 200001st street of EEPROM (S62). After this, a power source becomes off by the judgment (S59) of Flag FMEMO.
[0008] By doing in this way, storage maintenance of the thing for [before an engine failure] 10 seconds

and for 10 seconds after an engine failure can be carried out about data D1 - D10 at EEPROM. And the data before and behind the engine failure which carried out storage maintenance can be transmitted by demand of an electronic system diagnostic circuit tester using communication facility. The above is the conventional example of the data recorder for automobiles. Although this example explained the case at the time of an engine failure, it is clear that the record maintenance of the engine failure can be similarly carried out as a time of failure generating.

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EFFECT OF THE INVENTION

[Effect of the Invention] The cheap data recorder for automobiles can be realized by enabling it to detect cheaply, without using the accident judgment function used for raising, an air bag, etc. in detection precision by using the vehicle speed, an engine speed, and two combination or more of an ignition switch in order to detect accident according to this invention, as explained above.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, since it was not failure when a step on difference was carried out accidentally [accelerator pedal / a brake pedal and] and accident occurred by an operator's service abuse although it was recordable at the time of an engine failure and fault detection if it was in such a conventional data recorder for automobiles, data were not recorded, for this reason had the trouble that a cause could not be studied in case of accident.
[0010] In such a case, since it is especially becoming a problem at the occurrence time of accident, the method which detects accident and carries out storage maintenance of the data is considered easily. And in order to carry this out, approaches, such as using the decision part of the air bag already commercialized, can be considered. However, now, in slight accident, it could not detect and the costs which this takes also had troubles, such as being high.
[0011] This invention aims at being able to record data by the high probability also in the case of a service abuse, and offering the cheap data recorder for automobiles in view of such a conventional trouble.
[0012]

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MEANS

[Means for Solving the Problem] For this reason, in the data recorder for automobiles, this invention is considered as the configuration which has a means to record the performance data of an automobile to the timing determined with these at least two combination while it has a means to detect turning on and off of the vehicle speed of an automobile, an engine speed, or an ignition switch, as shown in drawing 1 .
[0013] Here, as for said timing, it is desirable to consider as the time of the stop before an engine shutdown.

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OPERATION

[Function] In this invention, when there is generally trouble of traffic after stopping a car and on-site preservation or during preservation at the time of the occurrence of accident, after putting away a car, it usually came out to once stop an engine and it paid its attention to a certain thing. Thus, it stops at the time of the occurrence of accident, and if there was accident when saying to reverse since the engine was usually stopped near the, it can be said that it is it at the about one - three stop time before an engine shutdown.
[0015] So, in this invention, the time of the stop before an engine shutdown is detected, and it is made to carry out record maintenance of the data before and behind that with the vehicle speed, an engine speed, or at least two combination of turning on and off of an ignition switch. Although it is common to see the vehicle speed as an approach of detecting a stop, you may judge with a stop with an engine speed being below a predetermined value.
[0016] Moreover, although it is common to detect the ON state of an ignition switch as an approach of detecting engine shutdown before, you may judge by the engine speed. Therefore, the vehicle speed, an engine speed, or at least two combination of turning on and off of an ignition switch determine the timing of data logging.
[0017] By doing in this way, accident is detectable by the high probability in the limited memory size.

[Translation done.]

* NOTICES *

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EXAMPLE

[Example] One example of this invention is explained below. The system chart of a data recorder is shown in drawing 2 . In addition, below taking the case of the data recorder to the control unit for engine control including electronic formula throttle control, it explains.
[0019] In drawing 2 , closing motion actuation of the throttle valve 3 is carried out by the throttle actuator 2, the inhalation air content to an engine 1 is controlled, and the amount of fuel supply is controlled by the fuel injection valve 4. and the inhalation in an engine 1 -- having ignition timing controlled, it is lit by the ignition plug 5 and gaseous mixture burns. Here, the throttle actuator 2, a fuel injection valve 4, and an ignition plug 5 are controlled by the signal from a control unit 20.
[0020] The signal from the crank angle sensor 6 which detects an engine speed, the accelerator sensor 8 which accelerator BEDARU 7 steps on and detects an angle (accelerator opening), the speed sensor 10 which detects the vehicle speed from the output-shaft revolution of transmission 9, and an ignition switch 11 is inputted into the control unit 20 for this control. In addition, 12 in drawing shows car electric load.
[0021] The control unit 20 is constituted including CPU21, RAM22, EEPROM23, the input circuit 24, and the output circuit 25. And the electronic system diagnostic circuit tester 30 is connected to a control unit 20, and this electronic system diagnostic circuit tester 30 can do the data exchange by communication link with CPU21.
[0022] In such a system, always CPU21 detects an engine speed, an accelerator opening, etc., and uses them for control, and also it records data on RAM22. In this case, the field which records the data for for 20 seconds is secured to RAM22, and data are overwritten and recorded in a cycle of 20 seconds. And the data in [after recording data] RAM22 are moved to EEPROM23 until it judges it as a stop and 10 seconds pass after a stop, when the vehicle speed becomes 0 km/h.
[0023] Moreover, an engine shutdown is judged with an ignition switch 11, and as shown in drawing 3 , storage maintenance of the data before and behind the stop of front [an engine shutdown (ignition switch 11 OFF)] 3 batch is carried out on EEPROM23. In addition, the field which records 10= 30 3x data for for 20 seconds (data for [before a stop] 10 seconds and for 10 seconds after a stop) as shown in drawing 4 is secured to EEPROM23, and the ten-piece record maintenance of the data before and behind the stop of front [engine shutdown] 3 batch shown in drawing 3 can be carried out.
[0024] The detail of record actuation is as the program shown in the flow chart of drawing 5 and drawing 6 (drawing 6 is a continuation of drawing 5). This program is performed repeatedly every 10msec(s). Step 1 (it is described as S1 in drawing.) In order to carry out record maintenance of the data fundamentally in it being the same as that of the following at the time of a stop, based on the signal from a speed sensor 10, it judges whether the vehicle speed is 0 km/h. In addition, you may judge with the time of a stop with an engine speed being below a predetermined value.
[0025] When the vehicle speed is not 0 km/h, Flag FMEMO is set to 0 at step 2, and the address counter N for RAM is counted up at step 3 the back. In addition, when N is set to 2000, it returns to 0 (steps 4 and 5), and thereby, count-up to 0-1999 is repeated, and is made to perform. And it writes in and records on Nx10th - the Nx10+9th street in RAM corresponding to N which inputs the record data D1 - D10 at

step 6, and repeats even 0-1999 at step 7.
[0026] Thus, when the vehicle speed is larger than 0 km/h, the data for for 20 seconds are always recorded by writing in in order, overwriting the newest data to the predetermined field (the 0-19999th street) of RAM22. When the vehicle speed becomes 0 km/h, before it judges whether 10 seconds passed and 10 seconds pass it at step 8, steps 3-7 are performed and record to above-mentioned RAM22 is continued.
[0027] After the judgment of the flag FMEMO in step 9, after setting after 10-second progress to FMEMO=1 at step 10, it progresses to step 11. At step 11, the value of the engine shutdown counter M which counts up for every engine shutdown by steps 20-22 later mentioned from the 600060 or 600061st street (area for M storing of drawing 4) of EEPROM23, and repeats even 0-9 is read . This counter M is used as an object for upper address assignment of EEPROM23.
[0028] Next, the stop counter L is counted up at step 12. In addition, when L is set to 3, it returns to 0 (steps 13 and 14), and thereby, count-up to 0-2 is repeated, and is made to perform. Therefore, this counter L is counted up for every stop, and is used as an object for lower address assignment of EEPRPM23 [2 / 0-].
[0029] And at step 15, they are read-out and 23 EEPROMs x(Mx3+L) 20000 from 0th - the 19999th street of RAM22 about the record data for 20 seconds. Address -(Mx3+L) x20000+19999 It writes in an address. Moreover, at step 16, the value of the counter N which shows the newest data location is written in the 2nd [600000+(Mx3+L) x] 600000+(Mx3+L) x2+1 street among the area for N storing of EEPROM23 (refer to drawing 4 ; the 600000-600059th street).
[0030] Thereby, they are 23 EEPROMs x(Mx3) 20000 by L repeating even 0-2. Address -(Mx3+2) x20000+19999 It comes to be recorded on it, the data before and behind the stop of the three newest batches always being overwritten by the field of an address. Since it is FMEMO=1 after this, it progresses to step 17 (drawing 6) from step 9.
[0031] At step 17, when an ignition switch 11 judges whether it is ON and becomes off, it judges whether 10 seconds passed after off at step 18, and when 10 seconds pass, it progresses to step 19. That is, 10 seconds after an ignition switch 11 becomes off, an engine shutdown is detected because it is, and it progresses to step 19. In addition, an engine shutdown may be judged from an engine speed.
[0032] In step 19, the value of the engine shutdown counter M is read from the 600060 or 600061st street of EEPROM23, and the value of the engine shutdown counter M is counted up at step 20. In addition, when M is set to 10, it returns to 0 (steps 21 and 22), and thereby, count-up to 0-9 is repeated, and is made to perform. At the following step 23, the value of the counted-up engine shutdown counter M is written in the 600060 or 600061st street of EEPROM23.
[0033] Thereby, record maintenance of the data before and behind the stop of the three newest batches is performed to another field of EEPROM23 at the time of the transit after the next start up. Thus, in this example, M can carry out [by] storage maintenance of the data for [before and after a stop] 20 seconds of front [engine shutdown] 3 batch and a total of 30 batches altogether about transit of the ten batches till then, when taking the value to 0-9 and reading data in a service station.
[0034] And it becomes a quite high probability that the data in case of accident are in this.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The functional block diagram showing the configuration of this invention
[Drawing 2] The system chart of the data recorder in which one example of this invention is shown
[Drawing 3] The timing chart of data logging of an example same as the above
[Drawing 4] Drawing showing the EEPROM record section of an example same as the above
[Drawing 5] The flow chart of an example same as the above (the 1)
[Drawing 6] The flow chart of an example same as the above (the 2)
[Drawing 7] The timing chart of data logging showing the conventional example
[Drawing 8] The flow chart of the conventional example same as the above
[Description of Notations]
1 Engine
6 Crank Angle Sensor
10 Speed Sensor
11 Ignition Switch
20 Control Unit
21 CPU
22 RAM
23 EEPROM
30 Electronic System Diagnostic Circuit Tester

[Translation done.]

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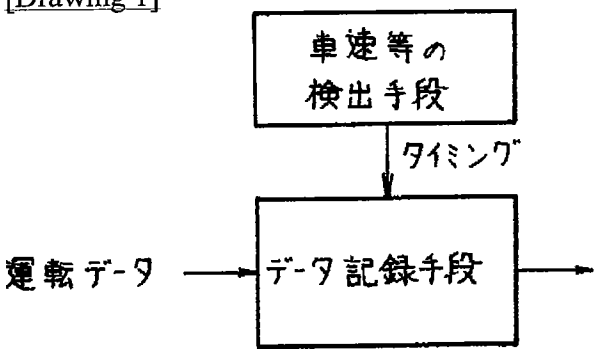
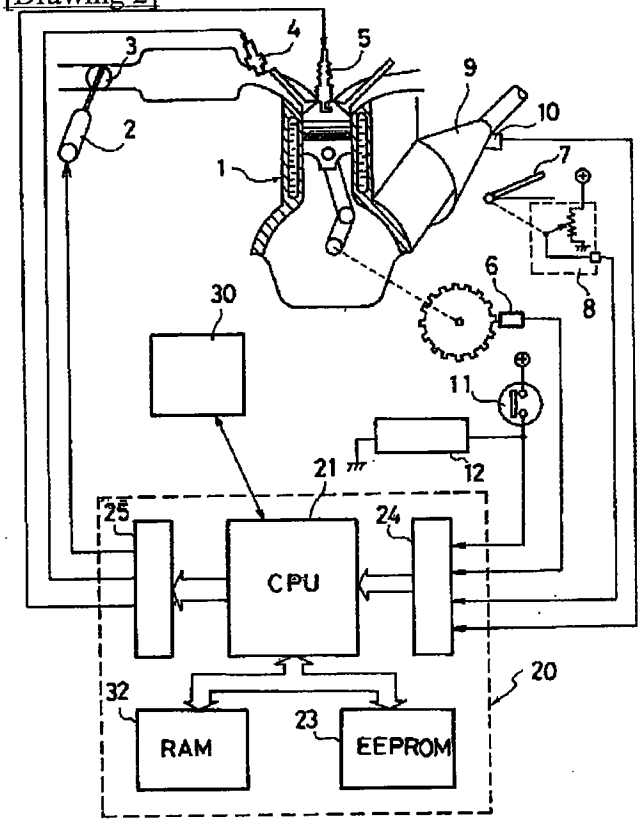
DRAWINGS

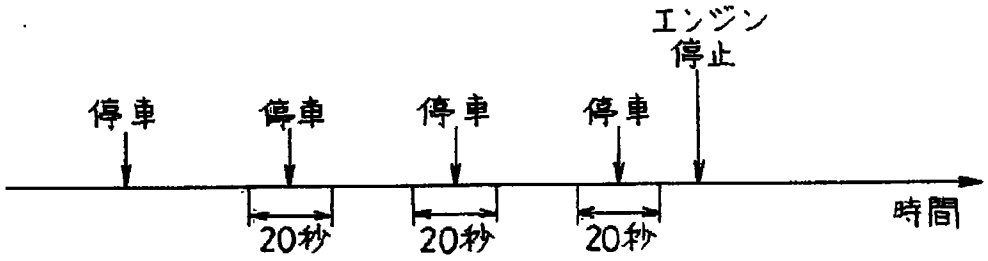
[Drawing 1]



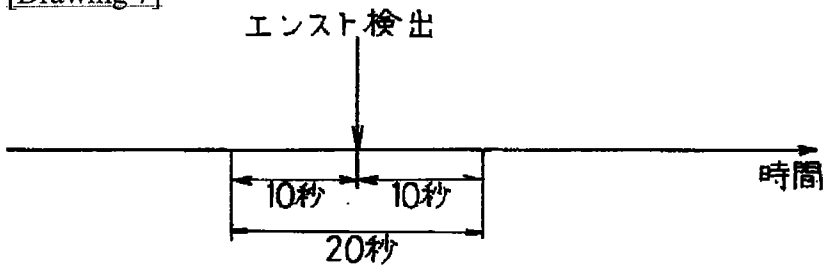
[Drawing 2]



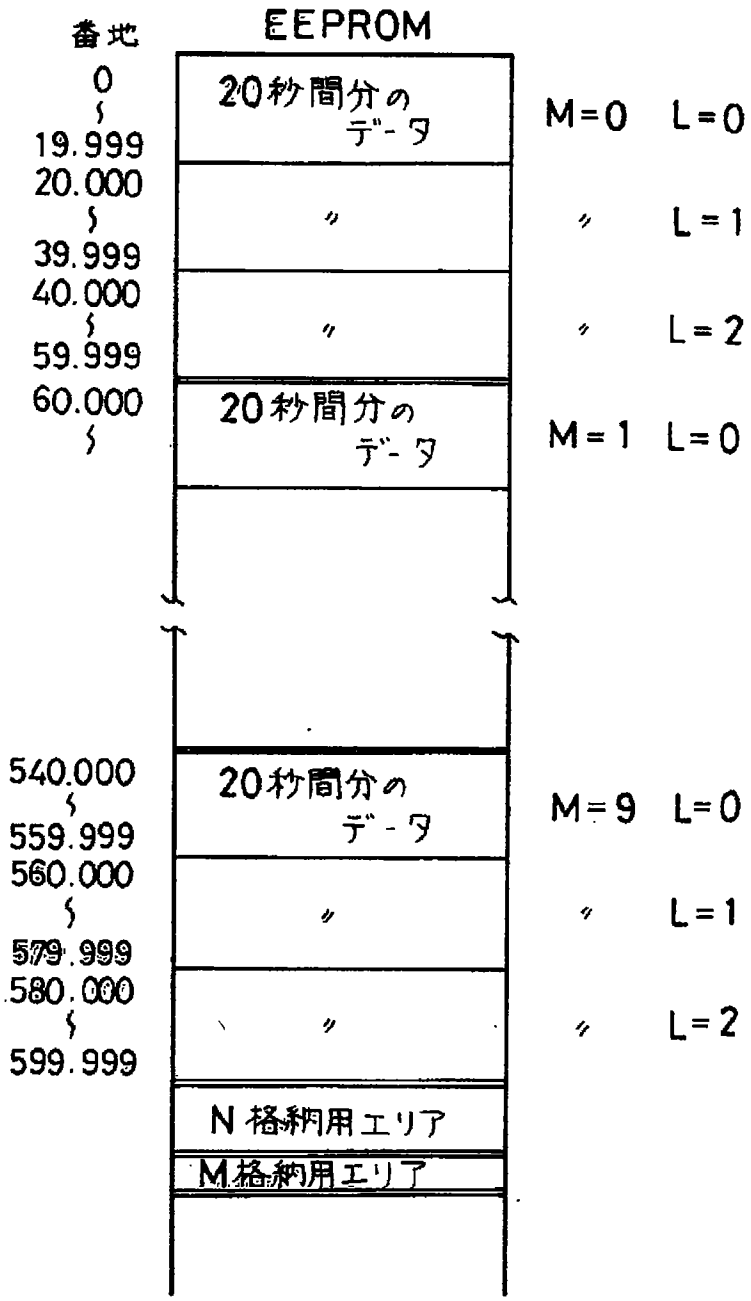
[Drawing 3]



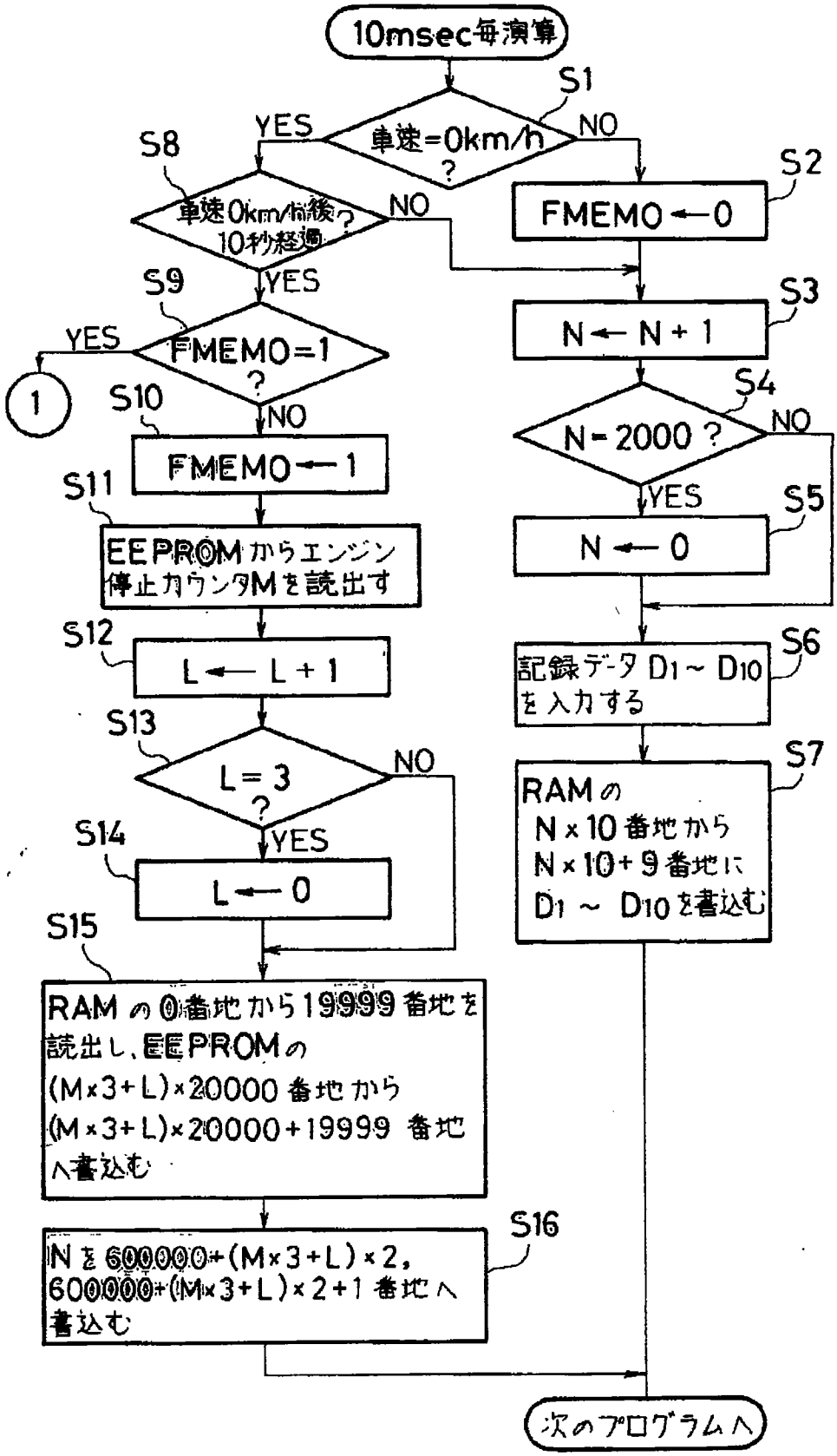
[Drawing 7]



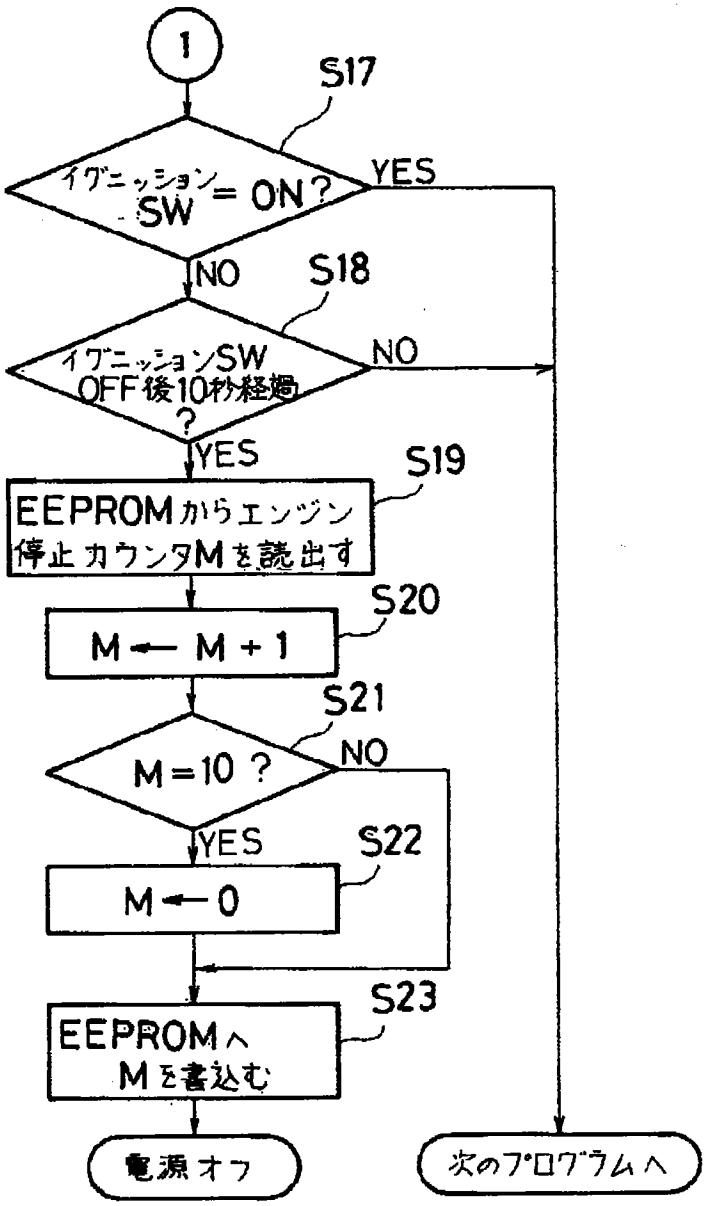
[Drawing 4]


番地
EEPROM
0
〜
19.999
20.000
〜
39.999
40.000
〜
59.999
60.000
〜
20秒間分の
データ
M=0 L=0
〃 L=1
〃 L=2
20秒間分の
データ
M=1 L=0
540.000
〜
559.999
560.000
〜
579.999
580.000
〜
599.999
20秒間分の
データ
M=9 L=0
〃 L=1
〃 L=2
N格納用エリア
M格納用エリア

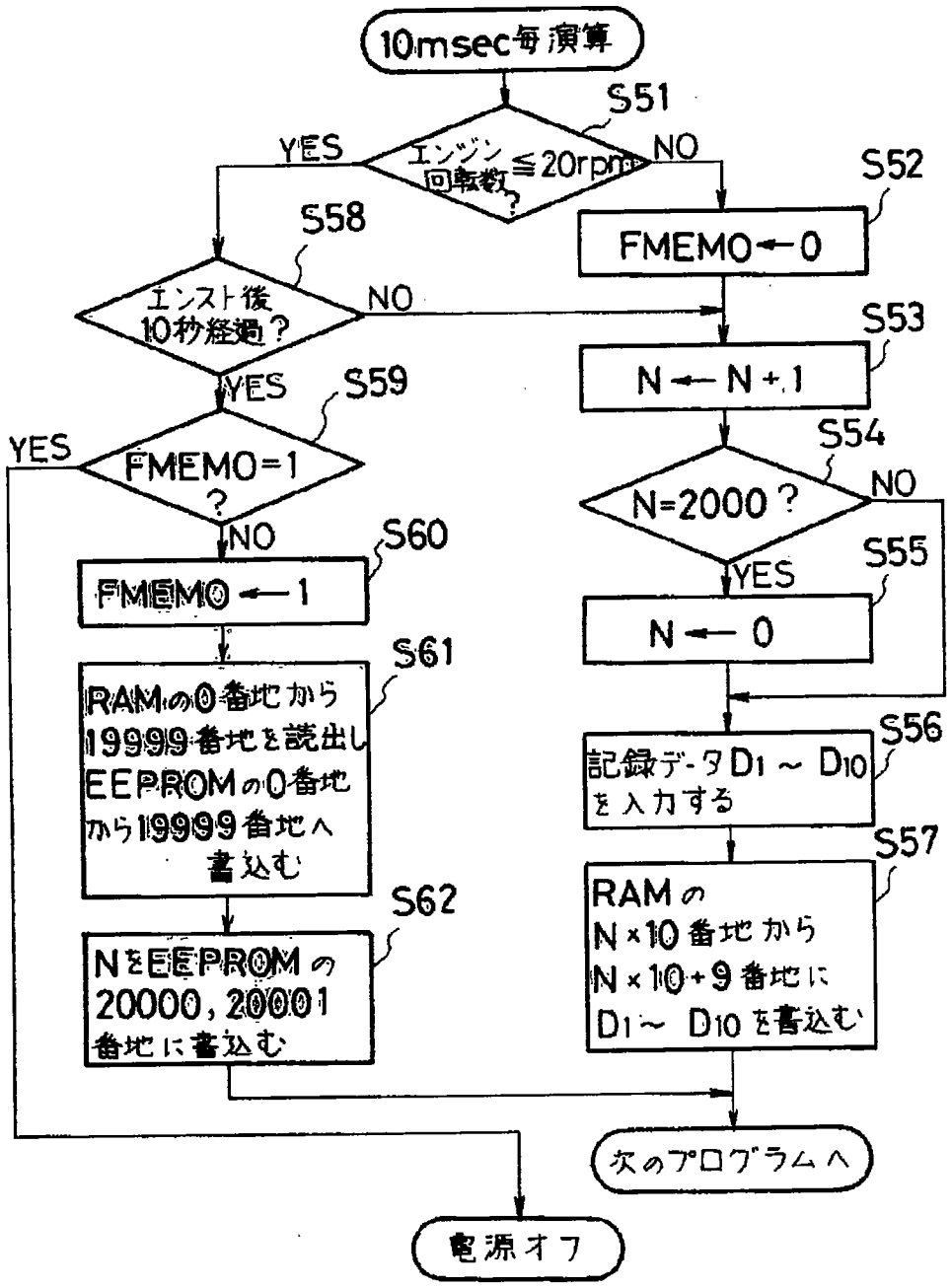
[Drawing 5]


10msec毎演算
S1
車速=0km/h ?
YES
NO
S8
車速0km/h後? 10秒経過
NO
YES
S9
FMEMO=1 ?
YES
1
NO
S10
FMEMO←1
S11
EEPROMからエンジン停止カウンタMを読出す
S12
L←L+1
S13
L=3 ?
NO
YES
S14
L←0
S15
RAMの0番地から19999番地を読出し、EEPROMの(M×3+L)×20000番地から(M×3+L)×20000+19999番地へ書込む
S16
Nを600000+(M×3+L)×2, 600000+(M×3+L)×2+1番地へ書込む
S2
FMEMO←0
S3
N←N+1
S4
N=2000 ?
NO
YES
S5
N←0
S6
記録データD1~D10を入力する
S7
RAMのN×10番地からN×10+9番地にD1~D10を書込む
次のプログラムへ

[Drawing 6]


1
S17
イグニッションSW = ON?
YES
NO
S18
イグニッションSW OFF後10秒経過?
NO
YES
S19
EEPROMからエンジン停止カウンタMを読出す
S20
M ← M + 1
S21
M = 10 ?
NO
YES
S22
M ← 0
S23
EEPROMへMを書込む
電源オフ
次のプログラムへ

[Drawing 8]



[Translation done.]